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भारतीय मानक  
उष्मा उपचारित इस्पात टैपिंग पेंच — यॉन्ट्रिक गुणधर्म  
( तीसरा पुनरीक्षण )

*Indian Standard*  
HEAT-TREATED STEEL TAPPING SCREWS —  
MECHANICAL PROPERTIES  
( *Third Revision* )

ICS 21.060.10

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**BUREAU OF INDIAN STANDARDS**  
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NEW DELHI 110002

## NATIONAL FOREWORD

This Indian Standard ( Third Revision ) which is identical with ISO 2702 : 1992 'Heat-treated steel tapping screws — Mechanical properties' issued by the International Organization for Standardization ( ISO ) was adopted by the Bureau of Indian Standards on the recommendation of the Bolts, Nuts and Fasteners Accessories Sectional Committee and approval of the Basic and Production Engineering Division Council.

This standard was originally published in 1974 and subsequently revised in 1982 and 1990. This revision of the standard has been taken up to align it with ISO 2702 : 1992 by adoption under dual numbering system.

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in the Indian Standards. Attention is drawn especially to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma ( , ) has been used as a decimal marker while in Indian Standards, the current practice is to use a point ( . ) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 1478 : 1983 <sup>1)</sup>	IS 5957 : 2002 Screw threads for thread forming tapping screws — Dimensions ( <i>second revision</i> )	Identical
ISO 6507-1 : 1982	IS 1501 ( Part 1 ) : 1984 Method for Vicker hardness test for metallic materials: Part 1 HV 5 to HV 100 ( <i>second revision</i> )	Technically equivalent
ISO 6507-2 : 1983	IS 1501 ( Part 2 ) : 1984 Method for Vickers hardness test for metallic materials: Part 2 HV 0.2 to less than 5 HV ( <i>second revision</i> )	do

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values ( *revised* )'.

<sup>1)</sup> Since revised in 1999.

# Indian Standard

## HEAT-TREATED STEEL TAPPING SCREWS — MECHANICAL PROPERTIES ( Third Revision )

### 1 Scope

This International Standard specifies the characteristics of heat-treated steel tapping screws, with tapping screw thread from ST2,2 to ST8 inclusive in accordance with ISO 1478, together with the corresponding test methods.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1478:1983, *Tapping screws thread*.

ISO 6507-1:1982, *Metallic materials — Hardness test — Vickers test — Part 1: HV 5 to HV 100*.

ISO 6507-2:1983, *Metallic materials — Hardness test — Vickers test — Part 2: HV 0,2 to less than HV 5*.

### 3 Materials

Tapping screws shall be made from cold heading, case hardening quality steel.

### 4 Requirements

#### 4.1 Metallurgical requirements

##### 4.1.1 Surface hardness

The minimum surface hardness after heat treatment shall be 450 HV 0,3 (see ISO 6507-2).

#### 4.1.2 Case depth

The case depth shall conform to the values given in table 1.

**Table 1 — Case depth**

Dimensions in millimetres

Thread	Case depth	
	min.	max.
ST2,2, ST2,6	0,04	0,10
ST2,9, ST3,3, ST3,5	0,05	0,18
ST3,9, ST4,2, ST4,8, ST5,5	0,10	0,23
ST6,3, ST8	0,15	0,28

#### 4.1.3 Core hardness

The core hardness after heat treatment shall be

270 HV 5 to 390 HV 5 for threads < ST3,9, and

270 HV 10 to 390 HV 10 for threads > ST4,2.

#### 4.1.4 Microstructure

The microstructure shall show no band of free ferrite between the case and core.

### 4.2 Mechanical requirements

#### 4.2.1 Thread-forming capability

Tapping screws shall form a mating thread without deforming their own thread when driven into a test plate, in accordance with 6.2.1.

#### 4.2.2 Torsional strength

Tapping screws shall have a torsional strength such that the torque necessary to cause failure, when tested in accordance with 6.2.2, shall equal or exceed the minimum torque values given in table 3 for the applicable screw threads.

5 Acceptance

For routine acceptance tests, the drive test, torsional test and core hardness test may be used, but for referee purposes all requirements specified in this International Standard shall be satisfied.

6 Test methods

6.1 Test methods for the metallurgical requirements

6.1.1 Surface hardness test

Vickers hardness test shall be carried out in accordance with ISO 6507-2.

The impression of the pyramid shall be made on a flat face, for preference on the screw head.

6.1.2 Case depth (microscopic test)

Case depth shall be measured at the thread flank mid-point between crest and root or, in the case of smaller tapping screws up to ST3,9, in the root of the thread.

For referee purposes, a micro hardness plot shall be made using a Vickers indenter and a 300 g load on the thread profile of a properly prepared metallographic specimen. The case depth shall be the point at which the hardness recorded is 30 HV above the actual core hardness.

6.1.3 Core hardness test

Vickers core hardness test shall be carried out in accordance with ISO 6507-1 at the mid-radius of a transverse section through the screw taken at a distance sufficiently behind the point of the screw to be through the full minor diameter.

6.1.4 Microstructure test

The microstructure test shall be carried out by metallographic examination.

6.2 Test methods for the mechanical requirements

6.2.1 Drive test

The sample screw (coated or uncoated, as received) shall be driven into a test plate until a thread of full diameter is completely through the test plate.

The test plate shall be made from low carbon steel with a carbon content not exceeding 0,23 %. The hardness of the plate shall be 130 HV to 170 HV measured in accordance with ISO 6507-1 and ISO 6507-2. The thickness of the plate shall conform to the values given in table 2.

The test hole shall be drilled, or punched and re-drilled, or reamed to the hole diameter specified in table 2 for the size of screw being tested.

Table 2 — Standard test plate thickness and hole diameter for drive test

Dimensions in millimetres

Thread	Plate thickness		Hole diameter	
	min.	max.	min.	max.
ST2,2	1,17	1,30	1,905	1,955
ST2,6	1,17	1,30	2,185	2,235
ST2,9	1,17	1,30	2,415	2,465
ST3,3	1,17	1,30	2,68	2,73
ST3,5	1,85	2,06	2,92	2,97
ST3,9	1,85	2,06	3,24	3,29
ST4,2	1,85	2,06	3,43	3,48
ST4,8	3,10	3,23	4,015	4,065
ST5,5	3,10	3,23	4,735	4,785
ST6,3	4,67	5,05	5,475	5,525
ST8	4,67	5,05	6,885	6,935

In cases where screws are plated subsequent to delivery to the purchaser (or where plating of screws is otherwise under the control of the purchaser), the producer is not responsible for failure due to plating. In such cases, the bolt manufacturer can only be held responsible if it is proved that the failure is not due to any post-treatment. Screws from which the plating has been stripped off cannot be considered as samples.

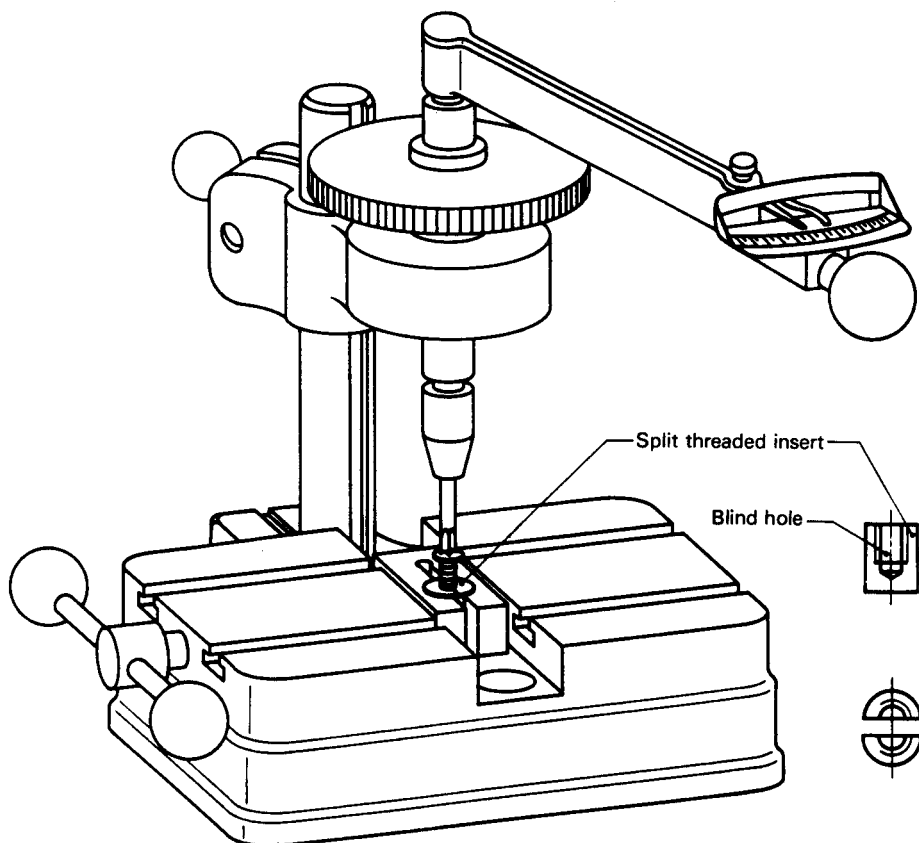


Figure 1 — Torsional test apparatus

### 6.2.2 Torsional strength test

The shank of the sample screw (coated or uncoated, as received) shall be clamped in a mating, split, threaded die or other device so that the clamped portion of the screw is not damaged and at least two full threads project above the clamping device and at least two full-form threads exclusive of point are held within the clamping device. A threaded insert with a blind hole may be used in place of the clamping device (see figure 1) provided that the hole depth is such as to ensure that breakage will occur beyond the point.

By means of a suitable calibrated torque-measuring device, torque shall be applied to the screw until failure occurs. The screw shall meet the minimum torsional strength requirements given in table 3.

Table 3 — Torsional strength

Thread	Minimum torsional strength N·m
ST2,2	0,45
ST2,6	0,9
ST2,9	1,5
ST3,3	2
ST3,5	2,7
ST3,9	3,4
ST4,2	4,4
ST4,8	6,3
ST5,5	10
ST6,3	13,6
ST8	30,5



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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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**Amendments Issued Since Publication**

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